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EVALUATION OF A DOUGLAS-FIR TUSSOCK MOTH OUTBREAK IN THE LOWER FLATHEAD VALLEY, MONTANA

by

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ABSTRACT

An aerial survey during 1974 revealed approximately 5,000 acres of various degrees of Douglas-fir tussock moth, *Orgyia pseudotsugata* McD., defoliation in the lower Flathead Valley. An egg mass survey was made in September to determine the potential for damage in 1975. Based on new egg mass densities, significant defoliation may occur on 2,880 acres.

INTRODUCTION

Outbreaks of the Douglas-fir tussock moth, *Orgyia pseudotsugata* McD., have occurred in stands of Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco, in the lower Flathead Valley, Montana, in the past. The first documented defoliation was detected on about 250 acres south of Polson, above the Kerr Dam, in 1964. In 1965, this outbreak declined to only 50 acres. Three new 10- to 40-acre areas were detected south of Elmo in 1965. By the end of that summer all infestations collapsed and no new egg masses could be found (Tunnock 1973).

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The next appearance of the tussock moth in this area was in 1970 when several ornamental spruce were defoliated within the city limits of Polson. Only one tree had detectable feeding on it in 1971 and no new egg masses were discovered (Tunnock 1973). There were no reports of tussock moth activity in the lower Flathead Valley during 1972 or 1973. In the late summer of 1974, BIA officials reported tussock moth activity north of Polson, near St. Ignatius and Ravalli. An aerial survey in September revealed 4,796 acres of light to heavy defoliation north of Polson. Another 6,875 acres are suspected to be infested though no defoliation is evident (Fig. 1). The infestations south of St. Ignatius and west of Ravalli are spots totaling 60 acres (Fig. 2). Ground examinations prior to the aerial survey verified the presence of the tussock moth.

The objectives of this survey were to (1) determine the extent of the infestation outside areas of visible defoliation; (2) conduct an evaluation designed to predict potential defoliation in 1975 by determining egg mass density, egg viability, egg parasitism, and virus incidence; and (3) determine the new to old egg mass ratio and egg mass to cocoon ratio as a measure of thriftiness of the outbreak.

METHODS

The evaluation was made during September 1974 by personnel from the U.S. Forest Service, Montana Division of Forestry, and Bureau of Indian Affairs.

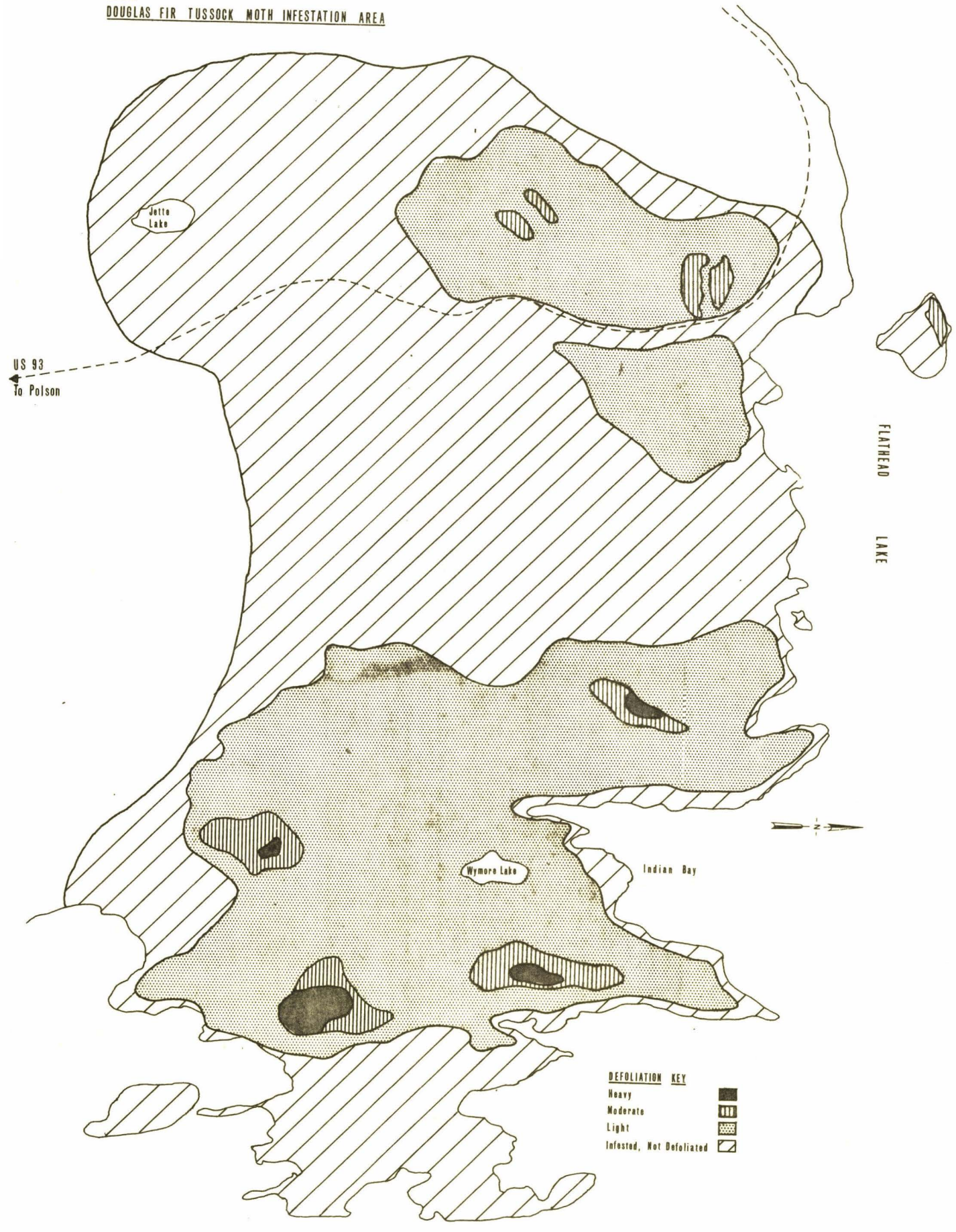
One plot was sampled in each quarter section in areas suspected of being infested with tussock moths. At each plot, five Douglas-fir from 6 to 12 inches d.b.h. were felled. From each sample tree, four entire limbs were removed from the lower, mid, and upper crown levels. The extreme length and width of the foliar area of each limb were measured in inches. The number of new egg masses, old egg masses, and cocoons were counted on each limb and recorded.

From these data, the number of new egg masses per 1,000 square inches of foliage; the ratio of old to new egg masses; and the number of cocoons per egg mass were calculated. If a plot contained 0.10 or more new egg masses per 1,000 square inches of foliage, it was considered "high risk" and control may be advisable (Tunnock and Livingston 1974).

If available, five new egg masses were collected from each plot. These were placed in cold storage and will be kept at 35° F. until February. They will then be incubated at 75° F. until hatch and the larvae reared on artificial food for 14 days. Egg viability, egg parasitism, and virus incidence on each plot will be determined. These factors could significantly influence a decision for or against control (Tunnock and Livingston 1974).

FIG. 1

DOUGLAS FIR TUSSOCK MOTH INFESTATION AREA



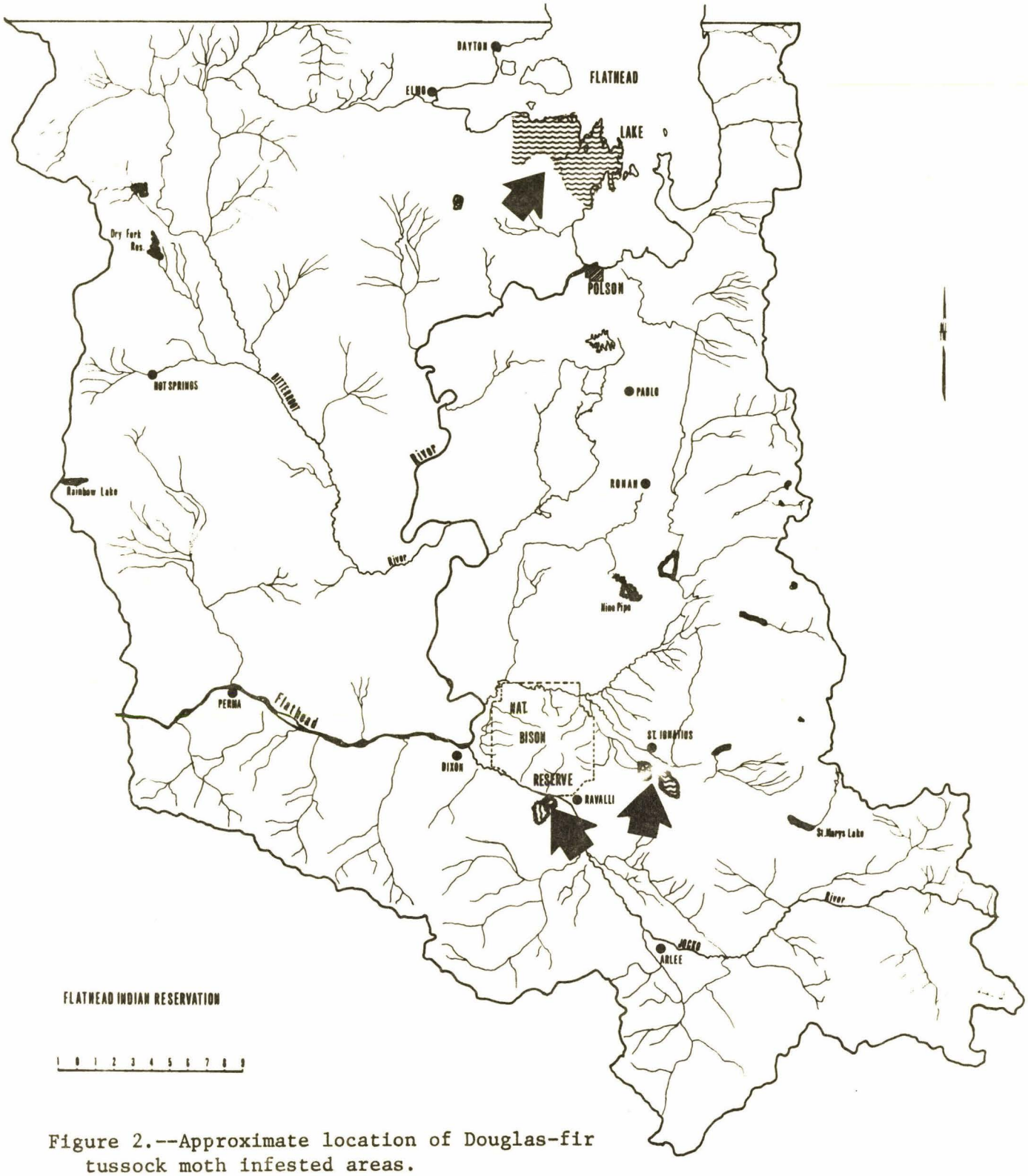


Figure 2.--Approximate location of Douglas-fir tussock moth infested areas.

RESULTS

Eighteen of the 68 quarter-section plots sampled contained more than 0.10 new egg mass per thousand square inches of foliage (Table 1). This indicates significant defoliation may occur on about 2,880 acres. In addition, some new egg masses were found on 29 of the remaining plots; therefore, light defoliation may be scattered over an additional 4,640 acres.

The cocoon to egg mass ratio was determined for all plots where egg masses were found. This ranged from 2.3:1 to 69.7:1 (Table 1). High ratios of cocoons per egg mass indicate that many pupae must have died from natural causes on those plots.

DISCUSSION

Though new egg masses were found at relatively high levels in some plots, as an average there were 1.43 to 1 old to new egg masses. This suggests that 1974 may have been the peak year of tussock moth activity and that some decline in defoliation may occur in 1975. This does not mean that significant permanent tree injury will not occur in 1975. Many trees are presently severely defoliated and cannot tolerate another season of feeding, even at a reduced intensity.

It was apparent from observing the outbreak prior to pupation and from the egg mass survey that a number of natural enemies of the tussock moth are active in this infestation. Larvae showing the symptoms of being virus diseased were observed and pupal parasites were abundant. The high ratio of cocoons to egg masses (average 13.3:1) indicates that most larvae never developed into adult moths.

Table 1.--Douglas-fir tussock moth egg mass and cocoon analysis from plots on the Flathead Indian Reservation during fall 1974.

Plot location	New egg masses/1,000 sq. in. of foliage	Ratio of old to new egg masses	Total new and old egg masses	Total cocoons	Ratio of cocoons to egg masses
	NORTH OF POLSON				
T. 23 N., R. 20 W. Sec. 3					
NW	0.28[1/]	0.1:1	14	73	5.2:1
SE	.00	0:0	0	0	0:0
Sec. 4					
NW	.05	3.5:1	9	136	15.1:1
NE	.06	7.7:1	26	421	16.2:1
SE	.54[1/]	1:1	51	462	9.0:1
Sec. 5					
NW	.15[1/]	.3:1	12	131	10.9:1
NE	.17[1/]	.3:1	9	125	13.9:1
SE	.03	4.0:1	5	91	18.2:1
SW	.19[1/]	.1:1	19	114	6.0:1
Sec. 6					
NW	.03	.5:1	3	62	20.7:1
NE	.00	0:0	0	0	0:0
SE	.01	1.0:1	2	35	17.5:1
SW	.07	.4:1	7	52	7.4:1
Sec. 7					
NW	.00	0:0	0	10	--
Sec. 8					
NW	.01	20.0:1	20	385	19.2:1
NE	.24[1/]	1.0:1	18	198	11.0:1
SE	.15[1/]	2.0:1	24	337	14.0:1
SW	.17[1/]	.3:1	16	213	13.3:1

1/ Meets control criteria of 0.10 or more new egg masses per 1,000 square inches of foliage.

Table 1.--Douglas-fir tussock moth egg mass and cocoon analysis from plots on the Flathead Indian Reservation during fall 1974, con.

Plot location	New egg masses/1,000 sq. in. of foliage	Ratio of old to new egg masses	Total new and old egg masses	Total cocoons	Ratio of cocoons to egg masses
		NORTH OF POLSON			
T. 23 N., R. 20 W. Sec. 9					
NW	0.04	8.0:1	18	326	18.1:1
NE	.36[1/]	.5:1	18	118	6.5:1
SE	.07	2.7:1	11	174	15.8:1
Sec. 10					
NW	.05	4.0:1	22	317	14.4:1
Sec. 17					
NE	.00	0:0	0	0	0:0
T. 24 N., R. 20 W. Sec. 31					
NW	.08	.2:1	6	14	2.3:1
NE	.15[1/]	.4:1	15	185	12.3:1
SE	.23[1/]	1.2:1	26	472	18.1:1
SW	.00	0:0	0	0	0:0
Sec. 32					
NW	.04	1.5:1	4	279	69.7:1
NE & SE	.17[1/]	.5:1	17	119	7.0:1
SW	.08	6.6:1	38	266	7.0:1
Sec. 33					
SE	.05	2.0:1	6	136	22.7:1
T. 23 N., R. 21 W. Sec. 1					
NW	.11[1/]	.7:1	10	117	11.7:1
NE	.01	0:1	1	12	12.0:1
SE	.01	0:1	1	4	4.0:1
SW	.06	0:1	4	25	6.2:1

Table 1.--Douglas-fir tussock moth egg mass and cocoon analysis from plots on the Flathead Indian Reservation during fall 1974, con.

Plot location	New egg masses/1,000 sq. in. of foliage	Ratio of old to new egg masses	Total new and old egg masses	Total cocoons	Ratio of cocoons to egg masses
T. 23 N., R. 21 W.					
Sec. 2					
NW	0.00	0:0	0	0	0:0
NE	.02	10.0:1	26	296	11.4:1
SE	.06	.8:1	7	99	14.1:1
SW	.00	0:0	0	0	0:0
Sec. 3					
NE	.00	0:0	0	0	0:0
SE	.00	0:0	0	0	0:0
Sec. 10					
NE	.00	0:0	0	0	0:0
SE	.00	0:0	0	0	0:0
Sec. 11					
NW	.00	0:0	0	0	0:0
NE	.00	0:0	0	16	--
SW & SE	.00	0:0	0	11	--
Sec. 12					
NW	.00	0:0	0	2	--
T. 24 N., R. 20 W.					
Sec. 17					
NW	.07	2.6:1	18	234	13.0:1
T. 24 N., R. 21 W.					
Sec. 11					
SW	.00	0:0	0	0	0:0
Sec. 24					
SE	.00	0:0	0	0	0:0

Table 1.--Douglas-fir tussock moth egg mass and cocoon analysis from plots on the Flathead Indian Reservation during fall 1974, con.

Plot location	New egg masses/1,000 sq. in. of foliage	Ratio of old to new egg masses	Total new and old egg masses	Total cocoons	Ratio of cocoons to egg masses
Sec. 26					
SE	0.04	7.3:0	8	271	33.9:1
Sec. 34					
SE	.00	0:0	0	0	0:0
Sec. 35					
NW	.12[1/]	.5:1	6	24	4.0:1
NE	.69[1/]	.6:1	70	606	8.6:1
SW	.00	0:0	0	0	0:0
SE	.02	11.0:1	12	209	17.4:1
Sec. 36					
NW & SW	.03	12.0:1	26	496	19.1:1
T. 24 N., R. 22 W. Sec. 36					
NW	.00	0:0	0	0	0:0
NE	--	--	1[2/]	0	0:0
SOUTH OF ST. IGNATIUS					
T. 18 N., R. 20 W. Sec. 26					
SE	.68[1/]	.5:1	61	1544	25.3:1
SW	.01	1.0:1	2	15	7.5:1
Sec. 36					
NW	.52[1/]	.4:1	78	511	6.5:1
SE	.05	.6:1	9	56	6.2:1
SW	.08	9.2:1	61	1151	18.9:1

2/ Formal plot was not sampled, but one new egg mass was found in area.

Table 1.--Douglas-fir tussock moth egg mass and cocoon analysis from plots on the Flathead Indian Reservation during fall 1974, con.

Plot location	New egg masses/1,000 sq. in. of foliage	Ratio of old to new egg masses	Total new and old egg masses	Total cocoons	Ratio of cocoons to egg masses
	WEST OF RAVALLI				
T. 18 N., R. 21 W. Sec. 36					
NW	0.52[1/]	2.0:1	103	1151	11.2:1
NE	.00	0:0	0	0	0:0
SE	.02	1.0:1	2	11	5.5:1
SW	.09	4.3:1	32	500	15.6:1

REFERENCES CITED

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Tunnock, S., and R. L. Livingston, 1974. Potential Douglas-fir tussock moth damage in northern Idaho in 1974 based on a 1973 fall egg mass survey. USDA Forest Serv., State and Priv. Forestry, Missoula, Mont., report 74-4.